

ATTORNEY DOCKET NO. 000211

IN THE TITLE

Please replace the title with the following:

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METHOD AND APPARATUS FOR PARTICIPATING IN GROUP
COMMUNICATION SERVICES IN AN EXISTING
COMMUNICATION SYSTEM

IN THE SPECIFICATION

Please insert the following paragraphs before the BACKGROUND OF THE INVENTION section on the first page of the specification:

CROSS REFERENCE TO RELATED APPLICATIONS

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This application is a division of U.S. Patent Application Serial No. 09/518,776, filed March 3, 2000, pending, which application is incorporated herein by reference in its entirety.

FEDERAL RESEARCH STATEMENT

The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of MDA904-96-G-0035 awarded by the National Security Agency.

IN THE DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please amend the first paragraph (lines 4-15) on page 9 of the application to read as follows:

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The net broadcast service (NBS) system enables Internet Protocol (IP) communication devices to participate in a group voice and data conference. NBS is primarily a Voice over IP (VoIP) application. Voice communication is transmitted from a talker endpoint communication device to one or more listeners by encapsulating voice frames in IP datagrams. Data with voice may also be transmitted in this manner. The NBS system is also described in US Patent Application Serial No. 09/518,776, filed March 3, 2000, and US Patent Application Serial

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No. 09/518,622, filed March 3, 2000, and are specifically incorporated by reference herein.

Please amend the first paragraph (lines 6-19) on page 10 of the specification to read as follows:

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Net members communicate with each other using an assigned communication device, shown as communication devices (CD) 12, 14, 16 and 17. CDs 12, 14, 16 and 17 may be wireline or wireless communication devices such as terrestrial wireless telephones, wireline telephones having push-to-talk capability, satellite telephones equipped with push-to-talk functionality, wireless video cameras, still cameras, audio devices such as music recorders or players, laptop or desktop computers, paging devices, or any combination thereof. For example, the CD 12 may comprise a wireless terrestrial telephone having a video camera and display. Furthermore, each CD may be able to send and receive information in either a secure mode, or a non-secure (clear) mode. Throughout the following discussion, reference to an individual CD may be expressed by a wireless push-to-talk phone. However, it should be understood that reference to a CD is not intended to be limited as such, and may encompass other communication devices that have the capability to transmit and receive packet information in accordance with Internet Protocol (IP).

Please amend the second paragraph (lines 20-26) on page 10 of the specification to read as follows:

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In the NBS system 100 of FIG. 2, a transmission privilege is defined which generally allows a single user to transmit information to other net members at any given time. The transmission privilege is granted or denied to requesting net members, depending on whether or not the transmission privilege is currently assigned to another net member when the request is received. The process of granting and denying

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transmission requests is known as arbitration. Other arbitration schemes evaluate factors such as priority levels assigned to each CD in determining whether a requesting net member is granted the transmission privilege.

Please amend the second paragraph (lines 7-14) on page 11 of the specification to read as follows:

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The CM 18 manages remotely through either a communication system service provider, net members, or both, assuming that authorization is provided by the service provider. The CM 18 may receive net definitions through an external administration interface. Net members may request administrative actions through their service provider or administrate net functions through defined systems, such as a member-operated security manager (SM) 20 that conforms to a CM 18 administration interface. The CM 18 can authenticate to high-grade commercial standards any party attempting to establish or modify a net.

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Please amend the fourth paragraph (lines 23-30) on page 11 of the specification to read as follows:

In one embodiment, the means for requesting the transmission privilege from a CD comprises a push-to-talk (PTT) key or switch. When a user in the NBS 10 desires to transmit information to other net members, the push-to-talk switch located on his or her CD is depressed, sending a request to obtain the transmission privilege from the CM 18. If no other net member is currently assigned the transmission privilege, the requesting user is granted the transmission privilege and is notified by an audible, visual, or tactile alert through the CD. After the requesting user has been granted the transmission privilege, information may be then transmitted from that user to the other net member.

Please amend the first paragraph (lines 15-27) on page 12 of the specification to read as follows:

A8 When a first net member wishes to transmit information to other members of the net, the first net member requests the transmission privilege by pressing a push-to-talk key on his or her CD, which generates a request formatted for transmission over the distributed network 26. In the case of CDs 12, 14 and 16, the request is transmitted over-the-air to one or more base stations 22. A mobile switching center (MSC) 28 comprises a well-known inter-working function (IWF) for processing data packets, including the request, between the MSC 28 and the distributed network 26. For CD 16, the request is transmitted via satellite to satellite gateway 24. For the CD 17, the request is transmitted to the Public Switched Telephone Network (PSTN) 30, then to a modem bank 32. Modem bank 32 receives the request and provides it to the distributed network 26. A NBS terminal 34 monitors traffic of the NBS system through its connection to the Internet 26. Since the NBS terminal 34 is connected to the Internet 26, geographic proximity to net participants is not necessary.

Please amend the fourth and fifth paragraphs (lines 27-32) on page 13 of the specification to read as follows:

A9 The NBS net may be within a stand-alone deployable cellular system, or a large multiple site configuration. In the case of a large configuration, multiple CMs may be deployed geographically to form a single, integrated system, each operates as a plug-in module into existing cellular infrastructure. As such, new features introduced by NBS nets are available to cellular users without requiring modification to existing cellular infrastructure.

Please amend the second paragraph (lines 27-33) on page 16 of the specification to read as follows:

A10 The CM node 228 provides centralized functionality associated with NBS nets. The CM node 228 comprises a session initiation protocol user agent server (SIP UAS) server 236, and CM manager 240, a central

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billing log 244, and an administration server 248. The SIP UAS server 236 supports user requests for net lists and handles SIP invite messages for nets. When a SIP invite message is received from a communication device, the net assigns the communication device to an appropriate MCU node 208, and directs the communication device to the MCU node 208.

Please amend the second paragraph (lines 7-14) on page 17 of the specification to read as follows:

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The central billing log 244 maintains time and identification information for billing purposes. The central billing log receives billing log information from a local log server 260 of the MCU node 208. Detailed log information of each user, such as which communication devices are active on the net, for how long, from where, and when and for how long each CD is a talker or a listener, is maintained. The Administration Server 248 supports an interface to allow the Administration workstation 224 to retrieve status information, initiate database administration and system management functions through the net status interface.

Please amend the fifth paragraph (starting at line 25 on page 17 through line 6 on page 18) of the specification to read as follows:

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Fig. 4 illustrates an example of a NBS SIP signaling protocol stack 300. The stack is a collection of protocol layers that implements network communication. The protocol associated with each layer communicates with the layers immediately above and below it, and assumes the support of underlying layers. Because UDP is a less reliable connectionless transport, application level reliability is preferable to insure robust communication, which is achieved by implementing by SIP compliant endpoints. Generally, SIP call-signaling 302 on UDP streams 304 are encapsulated within IP protocol 306. No special formatting is required. SIP call-signaling IP packets 306 are exchanged between, for example, a

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CDMA cellular based CD or a dial-up PSTN based CD, which are encapsulated within point-to-point protocol (PPP) frames 308. Accordingly, no special formatting is required. Also, SIP call-signaling PPP frames 308 exchanged between a CDMA cellular based CD and a base station are encapsulated within a radio link protocol (RLP) 310. For dial-up PSTN based users, an appropriate modem standard, such as V.32bis or V.90, may replace RLP 310. In either case, special treatment is generally not required and an error-free physical link is not assumed.

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Please amend the second paragraph (lines 11-21) on page 18 of the specification to read as follows:

Fig. 6 illustrates a real-time voice-media protocol stack 320. In this embodiment, vocoder payload data 322 is layered on real time protocol (RTP) 324. RTP 324 is then layered onto UDP 304 and IP 306. In an optional embodiment, compressed real time protocol (CRTP) header compression 330 is used to further encapsulate media traffic using RTP 324 at the application layer. Header compression techniques may be applied as appropriate to all UDP/IP incoming and outgoing UDP/IP traffic illustrated in Figs. 4-9. Media signaling requests and responses are encapsulated within UDP datagrams. When available, CRTP header compression may be applied to reduce the impact of sending uncompressed UDP/IP headers. In Fig. 6, CRTP compresses RTP layer 324, UDP layer 304, IP layer 306 and the PPP layer 308. In Figs. 4, 5 and 7-9, CRTP 320 compresses the layers between and including UDP 304 to PPP 308.

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Please amend the fourth paragraph (lines 26-32) on page 19 of the specification to read as follows:

Fig. 9 illustrates a DNS client protocol stack 338. Each CD includes the capability to resolve Internet domain names into Internet addresses using a Domain Name Service (DNS) protocol 340. The CD

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operates as a DNS client. The CD encapsulates DNS 340 requests using UDP 304, as shown in Fig. 9. In order for the CD to resolve DNS hostnames, the CD is provisioned with the IP network address of the DNS server 216, as shown in Fig. 3. The DNS address is also configurable by the CD service provider and, optionally, by the user.

Please amend the second paragraph (lines 21-30) on page 26 of the specification to read as follows:

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The MCU node 208 comprises of an MCU 252, a MCU node manager 256 and the local log server 260. The MCU node 208 and 212 may also optionally comprise of an additional MCU 264. The MCU node 212 is substantially the same as the MCU node 208. For description purposes, only the MCU node 208 is discussed herein. The MCU 252 is responsible for control of a single active net. The MCU supports SIP, media signaling, and media interfaces for the net, and provides the functionality associated with the normal operation of the net. Each MCU node 208 may have a pool of MCUs 252 that may be directed to manage nets as appropriate. Each MCU 252 provides a MCU management interface to support functions such as starting, stopping, and status reporting.

Please amend the third paragraph (starting at line 31 on page 26 through line 2 on page 27) of the specification to read as follows:

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The MCU node manager 256 monitors the operation of the MCU node 208 and manages the operation of each MCU 252 on its MCU node 256. The MCU node manager 256 also provides an external interface to the CM core complex 204 to allow for startup and/or shutdown, assigning a net to the node, and sharing of status information.

Please amend the first paragraph (lines 3-7) on page 27 of the specification to read as follows:

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The local log server 260 locally records all log events for the MCU node 208. The local log server 260 also responds to requests from the central log server 244 via its log events interface. Requests include uploading certain event classes or priorities. In order to prevent loss of events, the messages are stored in the local log server 260 until an acknowledgement is received by the central billing log server 244.

Please amend the first paragraph (lines 1-5) on page 29 of the specification to read as follows:

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The CD may support over-the-air provisioning to equip NBS group services. In the event that the group-list of the CD contains more than one net-address, no more than one net-address may be identified as a default net 514. If a net-address is selected, the CD attempts to automatically transition from the idle state 504 by attempting to join this selected net shortly after the CD is powered on.

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Please amend the third paragraph (lines 15-22) on page 39 of the specification to read as follows:

The SIP user agent server 252 assumes that the CD 352 generally responds to an AYT message 404 with an IAH response 408. If an IAH response 408 is not received within a reasonable timeout, the SIP user agent server 252 transmits a new AYT message 404 with a new *id*. If after a configurable number of retransmits, a response to the AYT message 404 is not received from the CD 352, the CD 352 is assumed to be unreachable and the SIP user agent server 252 removes it from the current list of net participants. Future media signaling messages from the removed CD 352 will be ignored (or will generate an error response) until the CD 352 successfully re-joins the net.

Please amend the fourth paragraph (lines 23-29) on page 39 of the specification to read as follows:

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The IAH message 408 is sent by the CD 352 to the SIP user agent server 252 to acknowledge receipt of a previously sent AYT message 404. The IAH message 408 comprises fields such as id, src, and reserved. The *id* field references a previously received AYT message 404 that the CD 352 is acknowledging. The *src* field uniquely identifies the CD 352 which sends the IAH message 408 response to the SIP user agent server 252. The *reserved* field reserves space in the IAH message 408 for optional capabilities.

Please amend the fifth paragraph (starting at line 30 on page 39 through line 5 on page 40) of the specification to read as follows:

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The SIP user agent server 252 assumes that the CD 352 acknowledges all received AYT messages 404 with an IAH response message 408. If the referenced AYT message 404 was sent to confirm that a CD 352 remains connected in the NBS quiet state, passively monitoring NBS media traffic and signaling, the SIP user agent server 252 notes the time of the IAH receipt 408 for future reference.

Please amend the second paragraph (lines 14-29) on page 42 of the specification to read as follows:

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As illustrated in Fig. 15, the SIP user agent server 252 will "wake-up" a net and bring it out of dormant mode 618 when a successful floor-control request 704 is received during dormancy. As soon as the floor-control request 704 has been granted, the SIP user agent server 252 will signal each registered CD 352 by requesting the *are-you-there* (AYT) message 716 over the media-signaling channel and start an internal wake-up timer 724. Each CD 352 acknowledges receipt of the AYT message 716 to the SIP user agent server 252 if it wishes to remain registered in the net. Optionally, a dormant CD 352 may buffer media traffic 740 from the time the user keys PTT until the CD 352 traffic channel is (re)connected. The SIP user agent server 252 may buffer media traffic 740 received from

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the talking CD 352 until the wake-up timer 724 exceeds the wake-up timeout, at which point, it begins forwarding media traffic to each registered CD 352 – including any members which have not yet responded to the AYT request 716. Thus, both the CD 352 and the MCU node 208 have the ability to buffer data until the recipient is ready to receive the buffered information. In an embodiment, portions of data are stored both in the CD 352 and the MCU node 208.

Please amend the third paragraph (starting at line 29 on page 42 through line 2 on page 43) of the specification to read as follows:

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The SIP user agent server 252 periodically retransmits AYT requests 716 to any registered CD 352 which has not acknowledged receipt of the AYT request 716. Once the wake-up timer 724 has exceeded a second longer *late-riser* timeout, the SIP user agent server 252 will unregister any member CD 352 whose AYT acknowledgement is outstanding and stop the wake-up timer 724. The SIP user agent server 252 ignores duplicate AYT requests.

Please amend the first paragraph (lines 5-7) on page 45 of the specification to read as follows:

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Fig. 14 illustrates a sequence of NBS media signaling messages 440 demonstrating a higher priority CD 444 interrupting a lower priority CD 442 with control of the net's floor.

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Please amend the third paragraph (lines 11-18) on page 45 of the specification to read as follows:

While the lower priority CD 442 is transmitting media 443, a second CD 444 attempts to interrupt by sending the SIP user agent server 252 a PTT message request 448 for the same net. The SIP user agent server 252 determines that the second CD 444 has higher priority than the talking CD 442 and immediately revokes control of the net's floor from

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the talking CD 442 by sending it an asynchronous PTX denial message 454. The SIP user agent server 252 then grants the PTT request 448 to the higher priority CD 444 with a normal PTX grant message response 452 and announces that the higher priority CD 444 has control of the net's floor.

Please amend the fourth paragraph (lines 19-22) on page 45 of the specification to read as follows:

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If the SIP user agent server 252 determines that the interrupting CD 444 does not have higher priority, the SIP user agent server 252 immediately rejects the PTT request 448 with a PTX message response 452 and continues to distribute media 456 from the talking CD to the net's participants without interruption.

Please amend the sixth paragraph (starting at line 32 on page 45 through line 7 on page 46) of the specification to read as follows:

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Figs. 15 and 16 illustrate operation of the CM 104 and CD 352, respectively, during various states. The CM 104 maintains an inactivity timer for each net, or the hang-time timer 620. When the inactivity timer 620 reaches a configurable prescribed value, the timer triggers the CM 104 to place the net in a dormant state 618 by broadcasting a media signaling message 696 to all net participants. Upon receipt of the message, a participating CD 352 may release its traffic channel and enter a dormant/idle state 844, or the CD 352 may ignore the message and remain in a connected state 820. In particular, net participants that are not operating over a channel, such as dial-up PSTN users, should ignore the media signaling messages.

Please amend the third paragraph (starting at line 19 on page 46 through line 2 on page 47) of the specification to read as follows:

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The net itself remains dormant until one or more participants trigger the transmission of a PTT request 704. If the CM 104 determines it can grant the PTT request message 704 (including performing any necessary arbitration to deal with multiple requests) it sends a request 716 to each listed net participant to trigger a transition out of the dormant/idle state 844. For any specific CD 352, the trigger may or may not be necessary, but each CD 352 nonetheless responds to the request. In this circumstance, when a net is transitioning out of the dormant state 618, the CM 104 refrains from sending the initial PTX grant response message 756 until a fixed but configurable delay, the PTX dormancy response timer 728, expires. After the timer 728, whose default value is typically be zero, expires, the CM 104 sends the PTX grant 756 as usual. However, the CM 104 continues to refrain from forwarding media to the net until a second related timer, the net's wake-up timer 724, expires. Both timers reset when the CM 104 determines that the dormant net's floor can be granted. The value of the wake-up timer 724 should not be less than the value of the PTX dormancy response timer 728. After the wake-up timer 724 has expired, the CM 104 begins forwarding media and media signaling and traffic flow normally. Both timers are configurable on a per net basis.

Please amend the first paragraph (lines 3-11) on page 49 of the specification to read as follows:

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A more complete description of the states of the CM 104 follows. The CM 104 implements the NBS Media Signaling state diagram 600 shown in Fig. 15 for each instance of a net. The CM 104 initializes in an idle state 604 when a net is created. The net remains in the idle state 604 as long as no net participant request PTT 608 is granted for control of the floor (612) and the net is not dormant (618). The CM 104 resets the hang-time timer 620 to zero upon entering the idle state 604. The CM 104 transitions from the idle state 604 to the grant state 612 when a PTT request 608 from a net participant is received. The CM 104 transitions

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from the idle state 604 to the go-dormant state 624 when the hang-time timer expires.

Please amend the third paragraph (lines 21-31) on page 50 of the specification to read as follows:

The CM 104 transitions from the failsafe-recover state 664 to the release-announce state 680 and sends a PTX deny message 688 to the current talker immediately upon entering the failsafe-recover state 664. The CM 104 transitions from the release-announce state 680 to the idle state 604 and sends a PTA release announcement 692 to all net participants immediately upon entering the release-announce state 680. The CM 104 transitions from the go-dormant state 624 to the dormant state 618 and sends a ZZZ message 696 announcing the net has gone dormant to all net participants immediately upon entering the go-dormant state 624. The net's state machine remains in the dormant state 618 as long as no net participant requests control of the floor. The CM 104 transitions from the dormant state 618 to the wakeup state 706 when a PTT request 704 from a net participant is received.

Please amend the fourth paragraph (starting at line 32 on page 50 through line 6 on page 51) of the specification to read as follows:

The CM 104 transitions from the wakeup state 708 to the dormant state 618 and sends a PTX deny response 708 to the requesting CD 352 if the arbitration algorithm denies control of the floor to the requesting CD 352. Since the net is dormant, this can happen only if the requesting CD 352 has listen-only privileges. The CM 104 transitions from the wakeup state 706 to a wakeup-pending state 712 and sends a AYT wakeup request 716 to all net participants if the arbitration grants control of the floor to the requesting CD 352. After sending the AYT wakeup request 716, the CM 104 considers the requesting CD 352 the net's pending talker.

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Please amend the second paragraph (lines 7-12) on page 52 of the specification to read as follows:

The CD 352 implements the NBS Media Signaling state diagram 800 shown in Fig. 16 whenever a user is participating in a net. The CD 352 initializes to a startup state 804 after the CD 352 accepts the net's session description by sending a SIP ACK message 808 to the CM 104. The CD 352 transitions from the startup state 804 to a startup-wait state 812 and sends a ASK request message 816 to the CM 104 immediately upon entering the startup state 812.

Please amend the second paragraph (lines 8-17) on page 55 of the specification to read as follows:

The CD 352 may be used to receive PSTN or secure point-to-point packet voice calls while group-services is enabled, within the limitations imposed by the cellular infrastructure. If the CD 352 joined a net, and the selected net is active, the CD 352 appears busy to an incoming PSTN call and the call is given the appropriate busy treatment by the cellular infrastructure. If the selected net is quiet but the net's hang-time 620 has not expired, the call is also given the normal busy treatment by the cellular infrastructure. However, if the selected net's hang-time 620 has expired, the net has been placed in dormant mode 618, and the CD 352 has released its over-the-air resources, the call may not be given busy treatment by the infrastructure and the CD 352 may be paged to initiate receipt of the incoming call.

Please amend the fourth paragraph (lines 20-29) on page 56 of the specification to read as follows:

Although NBS can operate over Mobile IP, Mobile IP may potentially adversely impact the end-to-end latency and perceived voice quality of NBS media traffic and signaling. This may be in particular of significance if the CD 352 joins a net using its permanent address and the

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home agent is located far, in a network topology sense, from the CM 104 and the CD 352. In such a case, media traffic may optionally be routed over the public Internet or other variable quality of service networks, which may not have been required if Mobile IP was not used. To avoid this, it is preferable for the CD 352 to access NBS services using its care-of address and re-join nets when its care-of address changes.

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Please amend the fourth paragraph (lines 18-26) on page 57 of the specification to read as follows:

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Public key cryptography generates a public and private key from a private secret key, typically known only to the encryptor (in this case, the CD 352). The private key, in combination with the secret, is required to sign a message, but the public key alone can be used to verify a signed message's signature. Thus, to support SIP authorization, each CD 352 is preferably provisioned with a private secret and private key, which are never shared. Each CM 104 to which the CD 352 may need to authorize itself should know the public key of the CD 352. Since the public key is not secret, it may be stored as part of the user portion of the database 232 maintained by the CM 104, or accessed through generic public key servers on the Internet.

Please amend the first paragraph (lines 4-13) on page 62 of the specification to read as follows:

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The key for an encrypted net may simply be a random (binary) number. In general, the key may be generated by one party in a net, or an administrator for that net, and distributed securely to the net participants. Since the key distribution policy is currently left to the net users, it is a potential source of compromise of the net security. Thus, it is recommended that the net encryption key be distributed using secure means, such as PGP encrypted e-mail, to the net participants. The security manager 20 (Fig. 1) also provides a central repository for common net